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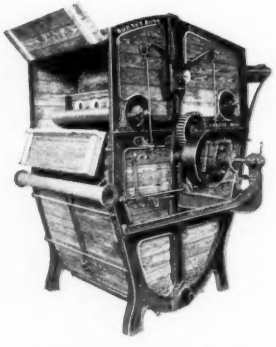

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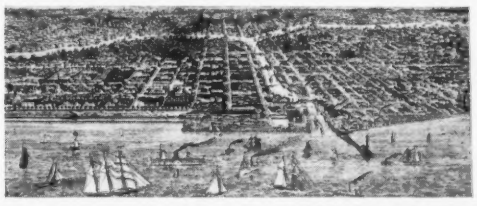

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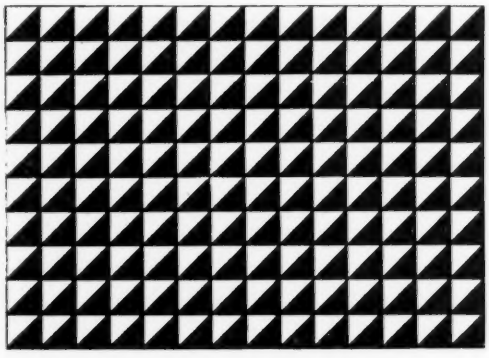

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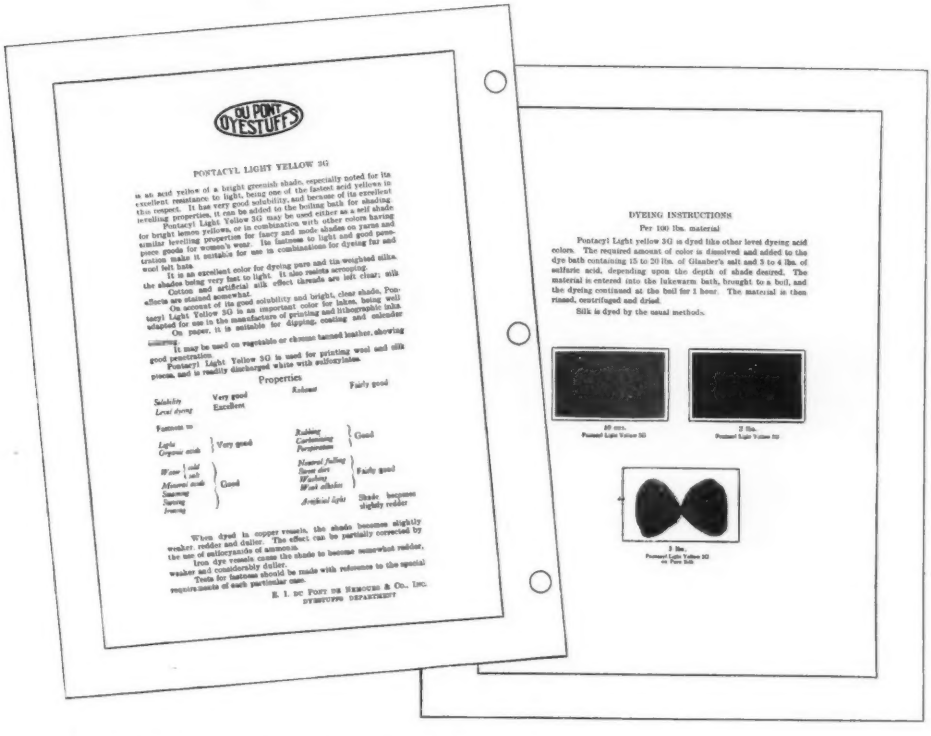

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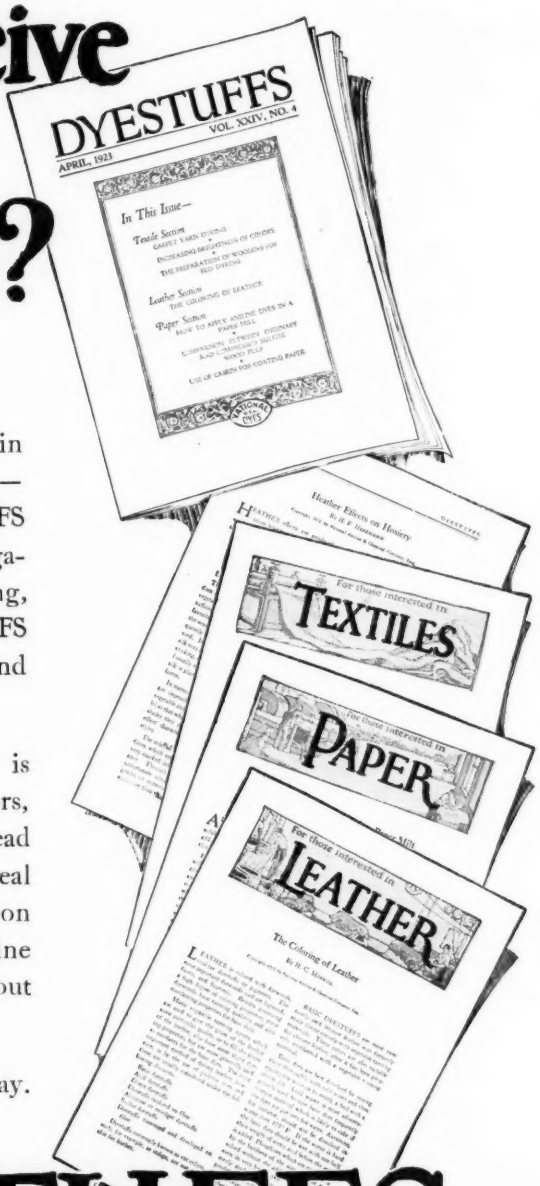

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VOLUME XII | NEW YORK, JULY 2, 1923 | NUMBER 14

Common Acid Yellows and Oranges — A Brief Consideration of Their Properties and Uses

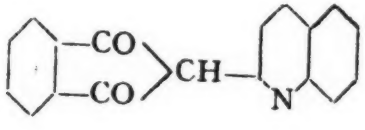
Part I

Quinoline Yellow—Xylene Yellow 2G—Naphthol Yellow—Tartrazine—Fast Light Yellow G—Fast Yellow G—Metanil Yellow

By GEORGE H. JOHNSON, B.T.C.

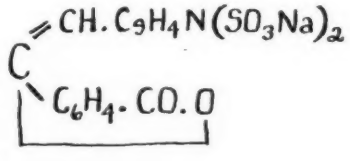
Quinoline Yellow

QUINOLINE Yellow appears on the market in the spirit soluble and water soluble forms. The spirit soluble is known chemically as quinophthalone and has the following formula:



Schultz No. 612

The water soluble form is the sodium salt of sulphonic acids (chiefly disulphonic acid) of quinophthalone.



Schultz No. 613

Quinoline Yellow is a dark yellow powder which dissolves in water giving a yellow solution. Hydrochloric acid (HCl) makes the solution paler, while caustic soda (NaOH) renders it darker. When dissolved in concentrated sulphuric acid (H_2SO_4) it forms a reddish yellow solution which becomes light yellow upon dilution with water.

Although the spirit soluble form is used chiefly for coloring varnishes and occasionally in silk dyeing, the more common water soluble form has a great variety of uses. It is used for dyeing silk, carpet yarns and to a lesser extent in the coloring of ladies' dress goods, felts, plushes, ladies' hats, etc. It also is used for staining paper and in the manufacture of pigments. Being very level dyeing, it may be used for a shading color where it is advantageous to use a greenish yellow.

Quinoline Yellow is dyed on wool in the usual way with the addition of Glauber salt and vitriol to the bath. Niter cake may be used in place of vitriol. Its properties are as follows:

Leveling power—Very good.
Light—Very good.
Alkalies—Good
Washing—Not good.
Acids—Good.
Stoving—Good.
Carbonizing—One of the fastest in its class.
Steaming, ironing—Good.

It tends to stain cotton thread effects when dyed in an acid bath.

Quinoline Yellow is dyed on silk in the usual acidified boiled off liquor. The spirit soluble form may also be used, hot methylated spirit acting as a solvent. When dissolved add to the dye bath and proceed with the dyeing. It gives greenish yellow shades on silk which are very fast to light.

This color is sometimes used for dyeing wool and silk unions. The bath is prepared with H_2SO_4 and color in the usual manner. Bring to a boil gradually and boil until the wool and silk have approximately the same depth of shade. If the silk is lighter in shade than the wool, as is generally the case with heavy dyeing, shut off the steam and bring the silk up to shade in fifteen to twenty minutes by adding more dyestuff. If necessary to tone the silk with basic colors let off the first liquor and top in a fresh bath at ordinary temperature with acetic acid and color. Then rinse.

Quinoline Yellow is occasionally used for coloring cotton when bright shades which are fast to light are required. This applies chiefly to materials such as yarn for trimmings, decoration materials, or bookbinder's cloth, which are not meant to come in contact with water. Yarn is dyed in a very short bath at about 120 deg. Fahr. with an addition of 5 to 10 per cent alum and 20 to 40 per cent common salt or calcined Glauber salt. Allow to cool in the bath, wring evenly without rinsing, and dry.

Jute is generally dyed at a boil with the addition of about 2½ per cent alum and 2½ per cent oxalic acid.

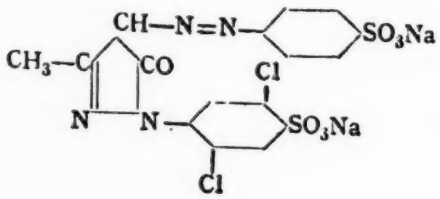
Wood fiber is occasionally dyed with Quinoline Yellow. The material must be first thoroughly wet out in hot water and bleached. It is then dyed with the addition of two to three pounds of 9 deg. Tw. acetic acid for one-quarter to one-half hour at the boil. Allow to remain in a cooling bath for one to two hours, depending on the depth of shade.

In conclusion, Quinoline Yellow is the greenest of acid yellows. It is used because of its extremely pure and bright shades.

Xylene Yellow 2G

Xylene Yellow 2G is prepared by treating 1-o-m-dichlor-p-sulphophenyl-3-methyl-5-pyrazolone with diazo compounds such as diazotized sulphanilic acid.

Sulphanilic derivative:



Schultz No. 22

Xylene Yellow 2G is a light, greenish yellow powder which gives a yellow colored water solution. When NaOH is added the solution goes slightly redder, while with HCl there is little change. It dissolves in H_2SO_4, giving an amber colored solution, which becomes yellow upon dilution with water.

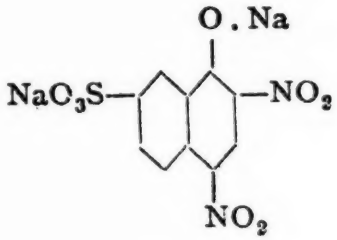
On wool its properties are as follows:

Leveling power—Very good.
Light—Very good.
Alkalies—Very good.
Washing—Good.
Acids—Good.
Perspiration—Good.
Stoving—Very good.
Rubbing—Very good.
Carbonizing—Good.

Xylene Yellow 2G is a very valuable yellow which finds favor in the piece goods trade. It may also be used with success in yarn dyeing, both on woolens and worsteds; that is, where acid colors prove satisfactory. It is dyed on wool in the usual manner with Glauber salt and vitriol, although when dyeing piece goods the use of niter cake is to be recommended. It is very level dyeing and may be used for shading in a boiling bath.

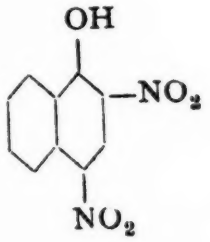
Naphthol Yellow

Naphthol Yellow is the sodium or potassium salt of 2-4 dinitro (1) naphthol (7) sulphonic acid.



Schultz No. 7

Naphthol Yellow is a light yellow or orange-yellow powder which gives a yellow water solution. HCl lightens the color without producing a precipitate. There is no change with NaOH. When dissolved in H_2SO_4 a yellow solution is obtained, which becomes lighter on dilution without producing a precipitate. The potassium salt is not readily soluble in cold water and even very dilute solutions of the dyestuff are precipitated by potassium hydroxide. The salt burns with scintillations when heated on platinum. Naphthol Yellow S is sometimes adulterated and cheapened with Martin's Yellow, which is the sodium, calcium or ammonium salt of 2-4 dinitro-1-naphthol.



Schultz No. 6

It may be detected in a mixture by adding HCl to an aqueous solution. Martin's Yellow is precipitated out or the solution becomes very milky. With pure Naphthol Yellow there is no precipitate. Furthermore, if the dry color is treated with ether the solvent is colored by Martin's Yellow and remains yellow even when soda is added. Ether is not colored by Naphthol Yellow itself.

When dyed on wool Naphthol Yellow possesses the following properties:

Leveling power—Very good.
Light—Not good.
Alkalies—Good.
Washing—Not good.

Acids—Moderate.
Stoving—Moderate.
Steaming—Not good.
Ironing—Not good.

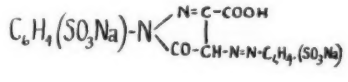
Has very little staining action upon cotton or silk effects.

Silk is dyed in an acidified boiled off liquor bath. Naphthol Yellow is also used for staining paper and in the manufacture of pigments. Sometimes it is used for staining cotton.

Naphthol Yellow is applicable for dyeing jute. If no special brightness is required the jute is dyed unbleached. Otherwise it must first be bleached with chemic. It may be bleached with potassium permanganate. If unbleached, yarn must be worked well in boiling water before entering the dye bath. Enter the well wet out jute in a short bath containing color and one to three pounds alum. Bring to a boil, boil one-half hour and then work half an hour longer in the cooling bath.

Tartrazine

Tartrazine is the sodium salt of benzene-azo-pyrazolone-carboxyl-disulphonic acid.



Schultz No. 23

Tartrazine is an orange-yellow powder. Its water solution is yellow. Hydrochloric acid renders the color more intense, as does NaOH. In H_2SO_4 the solution is orange-yellow; on dilution it becomes yellow.

Owing to its good fastness and level dyeing properties it is one of the most extensively used acid yellows. It is applied to raw stock, carpet yarns, piece goods, and often to felts, plushes, and ladies' hats. Although but moderately fast to milling, Tartrazine is suitable for flannels, as under normal conditions it does not bleed into white wool. It must always be remembered that if milled goods are allowed to lie damp for an unnecessary length of time with the milling liquor in them, even dyestuffs which ordinarily withstand milling successfully may bleed into white. It is best to rinse at once with water and finish the goods. Tartrazine does not stain cotton effects, although for best results the bath should be strongly acid. The fuller the shade the greater is the tendency towards staining. It is dyed on wool with Glauber salt and vitriol or niter cake and is often used for a shading color both in acid and chrome dyeing because of the leveling property. On wool it possesses the following properties:

Leveling power—Very good.
Light—Very good.
Alkalies—Very good.
Washing—Moderate.
Acid—Very good.
Stoving—Very good.
Carbonizing—One of the fastest of its class.
Rubbing—Excellent.

It is dyed on silk in acidified boiled off liquor and is one of the best of acid yellows on this fiber with respect to fastness to water. It does not bleed into white silk. In any event, the color may be made faster to water by an aftertreatment with tannic acid. On silk Tartrazine also shows very good fastness to light. When wool and silk shot effects are desired Tartrazine may be used with success, because no aftertreatment such as stripping is necessary; of course, the percentage of color must not be too high. If stripping is necessary boil five to ten minutes in a bath containing about three-quarters of a pint neutral ammonium acetate per hundred gallons of water. Do not boil too long or the wool shade will be affected. As a rule, however, Tartrazine stains silk so little in the presence of wool that stripping is not necessary.

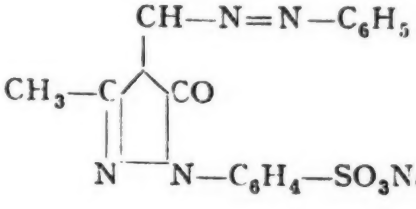
Tartrazine is also suitable for the dyeing of straw. The straw is first boiled out with water containing ½ per cent sodium acetate. This gives a yellowish bottom, making it difficult to dye pale shades. Tartaric acid gives a lighter bottom. In an especially clear bottom is required straw is bleached with peroxide. It is dyed at the boil from one to three hours with ½ to 1 per cent tartaric acid or ½ to 2 per cent of 9 deg. Tw. acetic acid. Then allow the material to stand an hour longer in the cooling bath. If dark shades are required the material is often allowed to stay in the bath overnight.

Tartrazine is also suitable for dyeing wood fiber, the same method being used as for Quinoline Yellow.

Fast Light Yellow G

Fast Light Yellow G is obtained by the action of aniline upon 1-para-sulphophenyl-3-methyl-5-pyrazolone.

Sodium salt:



Schultz No. 19

There are three Fast Light Yellows, marked G, 2G, and 3G. The 2G type is greener than the G product and the 3G still more so.

They are dyed on wool with Glauber salt and vitriol and possess the following properties:

Leveling power—Very good.
Light—Better than Tartrazine.

Alkalies—Good.
Acid—Good.
Washing—Moderate.
Stoving—Good.
Rubbing—Excellent.

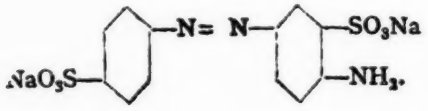
All in all, the Fast Light Yellows possess very similar properties to Tartrazine.

They are used extensively for dyeing carpet yarns, fancy yarns, ladies' dress goods and hats, and for all other types of acid dyeing where fastness to light is highly essential. For heavy compound shades such as browns, however, the cheaper Tartrazine serves the purpose fully as well, as due to the depth of shade satisfactory fastness to light may be obtained. But for the production of light and mode shades where a fast to light yellow is a necessity, the Fast Light Yellows are to be recommended. They are very level dyeing and may be used satisfactorily for shading in a boiling bath.

Fast Yellow G or Acid Yellow

The Fast Yellows are chiefly mixtures of amido-azo-benzene-disulphonate with some sodium amido-azo-benzene-monosulphonate.

Chief constituent:



Schultz No. 137

Fast Yellow G is a yellow powder giving a yellow colored water solution. Hydrochloric acid changes it to red-orange, NaOH causing no change. It dissolves in H_2SO_4, forming a brownish-yellow solution which becomes red upon diluting with water.

It is dyed on wool with Glauber salt and vitriol. Gives shades somewhat similar to Tartrazine but is not nearly as fast. The shades obtained are not as brilliant and are sensitive to acids to a marked degree. May be used successfully for the production of golden yellows and for shading greens, olives and browns where fastness to light and acids is not important. On wool it possesses the following properties:

Leveling power—Good.
Light—Fair.
Alkalies—Good.
Acids—Not good.
Stoving—Not good.
Carbonizing—Not good.
Steaming—Moderate.
Ironing—Moderate.

Fast Yellow G is seldom dyed on silk but can be dyed in acidified boiled off liquor. It may be dyed without boiled off liquor, only acetic acid must be used in such a case. It may be used in the dyeing of Gloria where shot effects are wanted, as in a boiling bath Fast Yellow G stains silk only slightly.

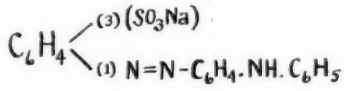
Fast Yellow R is very similar to the G type and is produced by sulphonating amido-azo-toluene.

It is a brown-yellow powder whose aqueous solution is yellow. Hydrochloric acid turns the solution crimson. NaOH produces no change. Solution in H_2SO_4 is yellowish-brown, which becomes magenta red upon dilution.

The properties of the R brand are similar to those of the G brand. The shade, however, is more orange-yellow.

Metanil Yellow

Metanil Yellow is the sodium salt of meta-sulphobenzene-azo-diphenylamine.



Schultz No. 134

Metanil Yellow is a brownish-yellow powder which gives an orange-yellow solution when dissolved in water. Hydrochloric acid gives a purplish solution and a dark flocculent precipitate. NaOH produces no change. Solution in H_2SO_4, violet; upon diluting, purple.

Wool may be dyed with Glauber salt and vitriol. Rinse well before matching, as the shade is quite sensitive to acids. It may be used for shading chrome colors provided no special fastness to washing is demanded. Its properties are as follows:

Leveling power—Very good.
Light—Good.
Alkalies—Good.
Washing—Moderate.
Acids—Not good.
Stoving—Not good.
Steaming—Not good.

In shoddy dyeing shades faster to milling may be obtained if the wool is first boiled for one hour with 2 per cent bichrome, 3 to 5 per cent copper sulphate and 2 per cent vitriol. Dye in a fresh bath without any further additions, except a small amount of sulphuric acid if necessary. Metanil Yellow may also be used on certain kinds of ladies' dress goods. Ordinarily it does not stain white cotton effects in woolen piece goods.

Metanil Yellow is dyed on silk in acidified boiled off liquor. The shades obtained are moderately fast against bleeding into white silk and fast to light. In the dyeing of Gloria, when applied in a strongly acid bath, Metanil Yellow dyes wool and silk alike as far as that is possible. Dye in a lukewarm bath with one pound of H_2SO_4 and color. Glauber salt should not be added, as in boiling the silk tends to become dull and lose its gloss. Enter the well wet out goods and bring to the boil in about half an hour. Boil fifteen minutes. If the silk is not

full enough, as is usually the case, shut off the steam, add more color and dye below the boil. If necessary to tone the silk do so in a fresh bath with basic colors.

Cotton may be dyed in a lukewarm concentrated bath containing ten to twenty pounds common salt per 100 gallons of liquor. Sometimes 5 to 10 per cent alum is added. Work the cotton in the bath about forty-five minutes, wring evenly without rinsing, and dry, cold if possible. The baths are never exhausted and should be kept standing.

Metanil Yellow is also suitable for dyeing wood chip and straw (see under Tartrazine) and for staining of paper.

(Part II will appear in the July 16th issue.)

Cotton Goods with the Silk Effect

Methods of Producing the Silk Effect—Theory and Technology of the Various Processes—Testing Theory for Practicality—A New Explanation of the Phenomenon—General Conclusions

By B. TEUFER

Textileberichte, 1923, 31-2; 130-1

Translated for THE AMERICAN REPORTER *by Ismar Ginsberg, B.Sc. Chem.*

THE technical literature contains references here and there to processes for producing the silk effect on cotton fabrics, but there does not appear to be any well-developed report on this subject, most of the data available being in the form of questions and answers. Various formulae are found, giving the different soaps and acids that are used for this purpose, but in none of the short articles that have been published on the production of the silk effect on cotton fabric is there any attention paid to the principles of the process or to an explanation of what actually takes place to cause cotton to assume the appearance of silk, so that the process can be scientifically controlled and perhaps improved. It is an essential matter in every technical process that the principles involved be thoroughly understood and it is particularly desirable in this case in order to produce the best and more durable effects on the cloth.

Hence it appeared advisable to the author to give his attention to the following questions: In what manner is it possible to produce the so-called silk effect on cotton fabrics and what is the explanation of this phenomenon? It is quite evident that when these two questions can be properly answered, there will be experienced no difficulty in the practical operation of the process. The author handled the problem in this manner: In the first place he studied the manner of producing this effect on cotton textiles in order to be able to derive conclusions therefrom regarding the scientific character of the process. Then these conclusions were substantiated and then a series of problems were outlined whose solution could be advantageously undertaken by textile technologists.

In order to produce the silk effect on cotton, for example, on cotton yarn, after the fibers have been thoroughly boiled out or after they have been dyed, they are treated for a sufficient length of time in a hot or boiling solution of soap, which must not be too weak. Then the excess soap solution is flung off in an extractor or without extracting the fibers are passed into a weak, cold or slightly warm bath of an organic acid, which does not attack cotton. After the last trace of free alkali has been removed, the fabric or yarn is thoroughly, although slightly, acidified. Then it is centrifuged again and finally dried thoroughly and quickly at a strong heat, until it is dried as much as possible. This is the way the standard method of producing silk effects in cotton goods reads. There may be certain unimportant differences in details.

It is generally well known that the silk effect can be produced on mercerized cotton more easily and with a more lasting effect than on raw cotton. It has also been noticed that the finer grades of cotton are more readily processed than the lower grades of cotton, Egyptian and Sea Island fibers with less difficulty than American cotton.

There are, however, quite a number of cases in which silk effects are produced in fabrics unintentionally. In fact, under certain conditions this may be decidedly disadvantageous. This happens quite frequently in bleacheries. Furthermore, it is found at times when cotton goods are boiled, acidified and then dried. Similarly it is found now and then on cotton goods which are colored green during the course of the aniline black dyeing process in the oxidation to emeraldine. If these phenomena are examined in order to establish the causes of the same, then, at least in accordance with the observations which the author has made up to the present time, it has always been found that the production of the silk effect always happens with cotton fabrics or cotton yarns, which for one reason or another, particularly due to the use of mill oil in the spinning process, become well smeared with grease.

On the other hand, there are cases in which only a fairly good silk effect is produced in cotton goods in spite of the greatest care and most painstaking efforts to produce the effect. Thus, for example, it is not possible to produce the silk effect on a cotton cloth dyed with

diamond black; similarly not on cotton, which, after dyeing, is so treated with chrome compounds that these forms in a certain degree a constituent of the color, which cannot be washed out. Even when, as has been mentioned previously, a good effect is produced on cotton goods in the green-colored condition in dyeing by the oxidized black method, the same is greatly improved after chroming or can be perfected by further treatment in various ways. On the other hand, if the chroming is supplanted by other operations, as for example, treatment of the green-colored cotton with soda or with a solution of potassium permanganate, then there is obtained a rather poor aniline black color, but it is possible to produce the silk effect on cotton goods, dyed in this manner, by the use of the common process.

If now the results that have been obtained by practical experience and the observations that have been made and discussed above in respect to the production of the silk effect on cotton goods and the failures to obtain the same, are carefully compared with each other, then the following conclusions may be reached: (1) That the silk effect can be successfully and easily produced on cotton goods after they have been mercerized—that is, after the cellulose has been converted into the hydrated condition; (2) that this effect is also obtained when the cotton cloth is treated, intentionally or not, with soap or as in bleaching the cotton is converted into the purest possible condition, in which no oxidation at all has taken place.

On the other hand, if the cotton is chromed in such a manner that the cellulose of the cotton enters into an intimate, if we do not say chemical, combination with the chromium, then the silk effect cannot be produced. Finally it must be remarked that in dyeing with the so-called sulphur colors, which means that the cotton is subjected to a very thorough cleansing through the treatment with sulphide of soda, a very good silk effect is produced in the dyed goods.

Character of the Silk Effect on Cotton Goods

In trying to explain the nature of the silk effect on cotton goods, it was found that there was little information available in the literature. All the explanations that are given seem to agree that it is caused by the rubbing together of invisible, minute crystals of fatty acids, which in the treatment of the cotton with soap and weak acid and on subsequent thorough drying become fixed to the fibers, and enter into a more or less intimate combination with them.

If this theory were the correct one, then right from the start every explanation that has been made to clear up the fact that the silk effect cannot be reproduced on cotton goods, well dyed with diamond black, or dyeing by the afterchrome method, cannot hold water. Furthermore, this explanation does not afford any information regarding the reason why the silk effect is so much more pronounced, the longer the cotton with the silk effect already produced in it is subjected to mechanical friction; that is, by pressing the goods in the hand. The aforementioned theory would afford much more readily an explanation why such mechanical friction would tend to reduce the degree of the effect, because this would undoubtedly serve to break up the supposed crystals of fatty acid or at any rate cut off the edges and corners of the same.

Testing Out the Theory Practically

As it seemed to the author that the fatty acid crystal theory could hardly be correct, he thought it advisable to make a little experiment to determine whether or not his supposition was true. To this end he tried to produce a few crystals of a fatty acid on the cotton goods of such size that they were at least visible under a powerful microscope. An entire series of tests were made and the goods were treated in many different ways. For example, they were subjected to treatment with highly concentrated solution of soap at a boiling heat or at temperatures varying from that point to the atmospheric. The boilings lasted several days. The goods were kept in motion or else allowed to remain at rest. They were treated with acids of all kinds, concentrations and for variable periods of time. Acids in the perfectly dry, dehydrated condition and wet with water were used. The treatment was carried out rapidly at high and the maximum temperatures, and slowly at lower temperatures, and in the open air as well when there was frost on the ground. All these tests yielded but one result. No visible crystals were produced in any of the experiments.

Convinced of the inaccuracy and untenableness of the fatty acid crystal theory, which is also contrary to pure chemical and crystallographic principles, the author thought it advisable to look for another explanation of the phenomenon of the silk effect on cotton goods. The observations that have been made on the production of the silk effect as well as certain experimental tests served as a basis for the development of the new explanation of the phenomenon. For it was seen under what conditions the most pronounced and most lasting silk effect was produced. It must be observed beforehand that the most pronounced silk effect is rapidly destroyed by the cotton goods coming into contact with water, but that the original effect is restored very frequently when the goods are dried again. This fact is probably well known.

New Explanation of Silk Effect Phenomenon

When the cotton goods are given a regular washing, then it is a very difficult matter for the effect to be restored in the same after drying, but when the washed goods is given an aftertreatment with acid, the silk effect is reproduced. All the tests which the author has made in the attempt to obtain a silk effect in cotton goods, an effect which is pronounced and of relatively long life—

and these tests have really been too many to be described here—he has remarked and he can state it as an essential condition, that the utmost care must be taken to cleanse and purify the cotton materials as thoroughly as possible, whether this cleansing process be mercerization, bleaching or repeated cooking and washing with water. Then the goods must be given an hour-long treatment with soap solutions of high concentration. These solutions must be used both in the cold and in the hot condition. There does not seem to be any great advantage gained by treating the goods in a boiling hot soap solution. Any kind of neutral soap can be used. Whether it be a potash or soda soap does not matter.

After the soaping treatment, however, it is important that the goods are freed as far as possible from the adherent soap solution, before they are introduced into the moderately warm acid bath. In fact, it is of great importance that all the soap be removed, which is accomplished by treating the goods in water baths, whose temperature varies from that of the atmosphere or lower to such as the hand can barely stand. Then the centrifuged cotton goods are placed in the acid bath, which is made to best advantage with formic acid or lactic acid. The duration of the acidification process need be short only.

Then the next step is to centrifuge the acidified goods and dry them thoroughly. A temperature of from 40 to 50 deg. Cent. is best for this purpose. In the acidification care must be taken that the concentration of the bath is not too low. But the acid bath can be used over again, after the necessary addition of a small amount of acid, if, as has been mentioned before, care is taken to see that every particle of soap and of soda as well is washed out of the cotton goods prior to their entrance into the acid bath. It is also evident that the organic acids, used in this process, must be absolutely free from any inorganic acid, as if any were present the well-cleaned fibers would be quickly destroyed and the fabrics rendered brittle.

Colored cotton goods, with the exceptions which have been discussed above, can be provided with the silk finish, but it must be remembered that in certain cases there will be some changes effected in the color tone due to the strong soaping and subsequent acidification. Cotton goods, dyed with sulphur dyestuffs, behave particularly well and take a fine silk finish by this treatment. In this connection it must be stated that not only must the dyeing process be carried out with great care, but the dyed goods must also be very thoroughly washed. If this is not done, due to the action of the organic acids, as the author himself had the opportunity to observe at frequent occasions, sulphuric acid is formed either very quickly or after many months standing from the sulphide of soda that is still found in the fibers. The ultimate result is that the goods gradually fall away into a powder. This happens most particularly with mercerized goods, which apparently are very difficult to deprive of their last traces of the sulphide by the regular washing process.

General Conclusions

The numerous experiments that were made by the author and the results that he obtained from them have led him to the conclusion that the process of producing the silk effect on cotton goods causes a chemical change to take place in the cotton cellulose, and it may be assumed perhaps with a great deal of certainty that the fatty acids of the soaps enter into a chemical combination with the cellulose, so that it is possible to speak of a cellulose salt of fatty acids. This theory is explained and substantiated by the different phenomena which are described herein.

1. The silk effect is produced effectively when the cotton is freed from all foreign impurities: after repeated thorough digestion and washing, after mercerization, after dyeing with sulphur dyes.

2. The silk effect cannot be produced on cotton cloths dyed with diamond black and other chromed colors, because in those cases the chromium enters into chemical combination with the cellulose to form cellulose chromate, which prevents the formation of cellulose salts of fatty acids.

3. Excess soap solution, adhering to the cotton goods, does not give any more favorable results, but has the effect of rendering the cotton goods more capable of absorbing atmospheric moisture as time goes on, which has the consequence of destroying the silk effect. This, however, can be re-created after the cotton goods are thoroughly dried.

4. The silk effect is not diminished by continued mechanical friction, but is intensified instead, as probably the fibers are crumpled together more strongly and expose more edges and corners, which when they move one over the other results in the familiar rustling noise of silk.

5. Finally it is possible to produce a gloss on the cotton goods by the application of pressure. The character of this luster is entirely different from that which can ordinarily be produced in cotton goods by the common methods in general use. (See German patent No. 281,507, June 21, 1913.)

NEW DU PONT PRODUCTS

E. I. du Pont de Nemours & Co. announce placing on the market as a new product Sulphanthrene Pink FF Paste, a pink of the vat type, having the particular advantage of extreme fastness to light, washing, and chlorine, on cotton.

They have also recently added to their list a product under the name of Lithosol Acid P, which product, however, is of interest only to manufacturers of lakes and printing inks.

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
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Vol. XII July 2, 1923 No. 14

NO NEW VOLUME

CONTRARY to our previous custom, no new volume of The REPORTER is begun with the mid-year. As announced on January 1, we shall hereafter have but one volume number for each calendar year. An index for 1923 will be included in the final issue in December.

COLOR AND FINISH SELL THE GOODS

IN a communication to The REPORTER—published in our last issue—George E. Templeton, manager of the Brook Woolen Company, used the phrase, "It is undoubtedly the color and finish that sell the fabrics." An advertising campaign currently appearing in leading textile publications uses the slogan, "The finish sells the goods." Apparently various elements of the textile fraternity are awakening to the very obvious truth contained in the foregoing statements.

To appreciate the full force of this truth it is only necessary to consider the viewpoint of the ultimate consumer of fabrics. In nine cases out of ten she or he, as the case may be, is totally devoid of any technical knowledge of textile manufacture. In considering the purchase of a garment or a piece of goods she has no intimate knowledge of its construction, nor can she gain it by any means at her disposal. She is dependent entirely upon the exercise of her normal senses of sight and touch. If it *looks* right and *feels* right the fabric is O. K. She trusts to luck or the salesman's word for its durability—this is something of which she has no certain knowledge within herself. But color and finish are in another class. These she can and does estimate for herself. If they please her, she buys; if not, she rejects. In short—they sell the goods.

This being the case, how can we overemphasize the importance of the dyer and finisher to the textile mill? No matter how perfect the work of the mechanical department, the fabric—from a standpoint of marketability—is made or marred by the dyeing and finishing operation. Yet, in many mills, we find that these departments are treated with scant consideration by the management.

Fortunately for the textile industry, this condition is not so prevalent as it was twenty years ago. The chemical phases of the industry are steadily gaining in importance and we confidently predict that another decade or two will witness the complete ascendance of the arts—or, more properly, sciences—of dyeing and finishing.

In the meantime, and in order to hasten this consummation, let everyone who has the best interests of this industry at heart lose no opportunity to impress upon mill owners and executives the importance to them of the chemical treatment of the fabrics they manufacture.

If mill owners wish to lead in the keen competition of to-day let them give foremost consideration to their dyeing and finishing departments. Let them provide proper laboratories and employ competent chemists. Let their dyehouses and finishing rooms be of modern construction and equipped with the most approved apparatus. Let the superintendents of these departments be men trained in the technology as well as the practice of their respective arts; let them be given authority—and paid accordingly. Most important of all, let the executives themselves be recruited from the ranks of those versed in the theory and practice of dyeing and finishing. This way lies success. The color and finish sell the goods.

THE NEED FOR ACCURATE BUSINESS INFORMATION

ONE of the great difficulties in gauging the future course of business is our lack of statistical information with regard to present conditions. Let us take for example the case of commodity stocks. Retailers, jobbers and manufacturers are not showing the inventories which were a conspicuous feature of 1919-1920. Yet it is to be remembered that until late in 1920 it was not known that there was an actual plethora of nearly every sort of goods. On the contrary, throughout the early part of that year and during most of 1919 there was a prevalent belief that the supply of goods was inadequate relatively to the demand.

The break in prices in 1920 revealed the fact that vast quantities of goods had been bought up for speculative purposes and temporarily withdrawn from the visible supply. Better statistics with regard to production, sales and consumption would have revealed the fact that somewhere along the line the flow of goods from producer to consumer was being dammed up and that an unhealthy situation was developing. The gaps in our present statistical information explain why forecasters sometimes hit so widely of the mark.

A question of vital importance at the present moment is whether production is running ahead of consumption. If that could be answered with a fair degree of accuracy we should then know better what lies immediately ahead. Obviously, if the present industrial output exceeds consumption, while the purchasing power of consumers is at its present high level, something more than a temporary lull or breathing spell would be indicated. It is hardly probable that there is much uniformity in this particular among different industries, and it would be well if we knew just which are well up with the market demand, and which have fallen behind.

It is known that during the last month there have been isolated instances of manufacturers laying off workers. Evidently these producers have caught up with their market. The cases reported are too few, however, to have any special significance. During the current year, with production running at such a heavy rate, it would not be surprising if in some cases it has actually overtaken consumption, but on this point our knowledge is of the vaguest sort. In some of the finer grades of textiles this has occurred. In the case of a raw material like steel we know that the mills are not piling up stocks, and that shipments continue unabated in spite of the check to forward buying. We do not know, however, just what the users of steel throughout the country have on hand, and that is just as important as the situation at the steel mills.

Unless production has run ahead of consumption, and considerable invisible stocks have accumulated somewhere between producer and consumer, it would seem logical to expect a steady demand and continued good business throughout the balance of this year at least. All recognized signs indicate that the purchasing power of the country is greater than was generally believed a year or so ago. It will easliy absorb normal production. In other words, the invisible stocks of merchandise are the only uncertain factors. Accurate statistical information in this regard—which is unfortunately unavailable—would go far towards settling the probable course of future business conditions.

A. C. S. JOINS GOVERNMENT TO ATTACK COMMERCIAL BOOTLEGGING

TO drive bootlegging from industry and to end what are called ruinous conditions in American business, a joint attack has been launched by chemistry and the Government. Co-operating with the Commissioner of Internal Revenue, according to the American Chemical Society, which makes the announcement, are chemical enterprises representing a billion dollars.

The initial step is the formation of the Alcohol Trade Advisory Committee, which is to direct the movement, nation-wide in scope, and constituting, officials of the society say, the first attempt to enforce the provisions of the national prohibition act for the development of lawful industries that use alcohol as a raw material.

William A. Sailer, of Baltimore, president of the American Drug Manufacturers Association, has been chosen chairman of the committee, and Dr. Harrison E. Howe, of Washington, editor of "Industrial and Engineering Chemistry," representing the American Chemical Society, secretary.

"Since the enactment of the national prohibition act, governmental conditions surrounding the manufacture, distribution, sale, and use of alcohol for industrial purposes have become so increasingly onerous as seriously to handicap the chemical industry," said Secretary Howe, explaining this fresh assault on the illegal liquor traffic.

"An elaborate system of public information will be built up by the committee for the guidance of the Prohibition Commissioner, and thus effective control of permits will be accomplished. The committee aims to aid in driving from commerce the bootlegger who masks his real purposes under the guise of a wholesale druggist or a manufacturer of flavoring extracts. By posing in this way he is able to obtain permits to sell straight alcohol to the drug trade and to physicians.

"The bootlegger in the chemical industries can undersell the legitimate manufacturer and more than make up this loss by illegal trade. The committee plans to make it easier for the legitimate manufacturer to secure the supplies he needs. Under the present situation this task is difficult.

"The work of the committee is, therefore, twofold: First, to end bootlegging in industry, and second, to promote the lawful use of alcohol in industry.

"Alcohol is admittedly a basic chemical essential to our national defense, industrial and economic development, and even to the advancement of civilization itself. Therefore, all who believe in law enforcement should recognize the intolerable situation to which the chemical industry has been brought by failure to properly enforce the industrial alcohol features of the law, and should make certain that it is administered as intended by Congress.

"Prohibition Commissioner Haynes has informed the committee that the unit desires to co-operate with industry in solving the many new difficulties and to give everything to manufacturers that is due them under the law, at the same time apprehending all offenders.

"Judge Britt is of the opinion that the committee can render great service in giving advice regarding regulations prior to their promulgation and in further assisting James M. Doran, chemist of the Bureau of Internal Revenue, in providing technical information necessary in carrying out the provisions of the law.

"The industry recognizes that its livelihood depends upon a proper use of non-beverage alcohol. It purposes to aid in stamping out the improper use of alcohol and in finding a way to do this without ruining business through improper and unnecessary regulations. To these business men, the willingness of the commissioner to

seek advice on technical matters from this committee is a very welcome sign of whole-hearted co-operation and a long step in the right direction.

"Provision has been made for promptly obtaining the advice of the various members of the committee on any matter submitted to it by the commissioner, and it expects to be active in every sense of the word."

Mr. Howe asserted that the former governmental policy of trying to scramble the enforcement of prohibition and the administration of the legitimate uses of industrial alcohol into one political organization had proved a signal failure with respect to industrial alcohol. Now, he said, the Commissioner of Internal Revenue will have the active support and assistance of a committee of commercial and technical experts to assist the prohibition unit in investigating all applications for permits and furthering the uses of industrial alcohol in scientific research.

Scientific Washing—V

Iron—As You Find It in Your Water

By F. H. GUERNSEY

Chief Chemist, Cowles Detergent Company, Lockport, N. Y.

IRON, as an impurity in water used in the textile and power laundry industries, is the cause of far more trouble than is generally realized. Comparatively small quantities necessitate purification, or at least special precautions during use.

Good dyeing, mercerizing, bleaching, scouring, washing, etc., are impossible in the presence of an appreciable quantity of iron, and it would appear that the importance of iron is neglected in the customary methods of reporting water analyses. Just as much emphasis should be placed upon the iron content as is placed upon hardness.

In the power laundry washroom, precipitated iron frequently causes rusty or dull spots, the blame for which is usually placed elsewhere due to a lack of information upon the subject.

How Iron Exists in Water

As a rule, iron normally appears in water as bicarbonate of iron, which, upon heating, is converted into the carbonate, a white compound which quickly turns to reddish brown. There are also both sulphates and chlorides of iron in many waters. Iron compounds exist in two forms known technically as "ferrous" and "ferric" compounds, the latter being in a higher state of oxidation. Thus, oxide of iron might exist as ferrous oxide, or ferric oxide. The ferrous compounds are nearly all white or green in color, but change rapidly into the ferric state in which the characteristic color is reddish brown.

Where the Iron Comes From

In large communities, where the modern practice of sterilizing water by chlorine gas is employed, much of the iron is oxidized by the chlorine to the ferric state, its staining qualities thus being increased. Furthermore, chlorinated water is very corrosive to iron and steel, with the result that additional contamination of the water occurs from this source.

While much of the contamination occurs before the water comes into one's plant, it is clear that further absorption of iron by water takes place in the hot water heating systems, and exhaust steam systems.

The sources are:

1. Natural iron content due to solvent action of ground waters. (Water containing appreciable amounts of carbon dioxide will absorb more iron.)
2. Corrosion of mains in the city supply system.
3. Hot water heating systems.
4. Exhaust steam systems.

How Alkali Affects the Iron Compounds

In the washing process itself we have some, though usually insignificant, corrosion due to the use of acids and alkalies.

Unfortunately, alkalies (any alkali) have the property of forming a jellylike, reddish brown, iron hydroxide from the iron compounds present in water. Caustic is the most pronounced in this effect. In this reaction everything works to the disadvantage of the washer. To explain:

1. We *must* use alkali to assist in cleansing.
2. The very nature of the iron compound formed—i. e., gelatinous and bulky—causes it to become caught and held in the cloth fibers.
3. The textile fibers have a natural affinity for this substance and hang on to it tenaciously.
4. The alkali itself adheres to the iron compound and defies rinsing.
5. This iron compound has a tendency to intensify the destructiveness of chlorine bleach, the result of which is spotty tendering.
6. Bleach has no bleaching effect upon it.

7. In addition to staining, iron combines with soap to form a dark colored, insoluble soap.

How to Overcome the Effect of Iron

The production of white work in the presence of such obstacles is obviously impossible. We are all therefore deeply interested in ways and means of circumventing such trouble.

1. Eliminate the contamination at its source if possible. The user has no control over outside contamination but an occasional flushing of the hot water or exhaust steam systems should help considerably. It is possible to secure equipment on the market for the chemical removal of iron from water, but in the average mill the cost would not be warranted. Brass piping has been suggested, and is in use in many plants, giving reasonably good service. When brass pipe is used, a smaller diameter is usually satisfactory because there is less incrustation formed on the inside. This lowers the cost of installation.

2. The washing formula may be revised to correct most of the trouble, provided steps cannot be taken such as to prevent contamination of the water. We suggest the addition to the bath of about a cupful of ordinary sugar just prior to the addition of soap and alkali. Sugar greatly retards and often prevents entirely the formation of the jellylike iron compound. The iron remains dissolved or suspended in such fine particles that it will pass through the fabric and be rinsed away.

3. The sour used should be one which will dissolve iron and form a colorless compound with it. Such sours are oxalic acid and the hydrofluoric acid compounds used in several of the proprietary sours. These may be used with acetic acid, which, however, has but slight solvent powers on iron compounds. The hydrofluoric and acetic mixtures are the less harmful. Special mention might be made here of the sour known as "Erusto." It is excellent for clearing up iron spots.

Very often proper souring alone is sufficient to correct the condition, and wherever a sour is used, part of it at least should consist of an iron-dissolving acid.

The above recommendations constitute the principal means of relief from this trouble, and their application will bring good returns in the nature of better quality washing.

THE CHINESE COMPRADOR

According to the Far Eastern Division of the Department of Commerce, the comprador, the medium of dealings between foreign firms and Chinese merchants and dealers, is one of the most important institutions of China in foreign trade relations. Ever since the beginning of foreign intercourse in China the comprador in a foreign firm has been indispensable. Barriers of language and social customs made the employment of the comprador a necessity, and as he was virtually the manager of the foreign firm his responsibilities and duties have increased.

Compardors must possess capital, a knowledge of business and an extended acquaintanceship among the Chinese. There are two main classes of compradors—bank and merchandise compradors—whose functions are quite similar. The duties of the bank comprador are: To transact business for the bank; to look after all monetary matters, such as the receipt and payment of money and the collection of checks, drafts and notes; to offer advise to the bank regarding the condition of the local market to complete commercial information, and to recommend, control and guarantee the Chinese staff of the bank. The merchandise comprador, as in the case of the bank comprador, must guarantee the firm's Chinese customers, advise as to market conditions, assist in obtaining business and, in general, act as a go-between and manager for the firm in its relations with the Chinese business public. The contract of the comprador generally allows him one-half of 1 per cent commission on all business done, based on the cost, insurance, freight value of the goods sold. If the volume of business is exceptionally large, the commission is only one-fourth of 1 per cent.

The written contract now in vogue is based on the principle that the comprador must guarantee the commercial and financial standing of all Chinese firms introduced by him to the foreign firm, which is practically the same as the old verbal contract. But the legal protection afforded by the written contract and the sense of security obtained has done much to standardize the position of the comprador and to prevent misunderstandings detrimental to trade relations.

In the development of the foreign trade of the new China the comprador will be a greater factor than in the past. The American business man should work with him rather than apart from him, learn to know him and his methods, utilize his services, teach him to understand American methods and salesmanship, with the object in view of training a responsible Chinese staff under a competent and responsible Chinese head.

NEW CARBOY BOX FOR SHIPPING LIQUID CHEMICALS

The Hercules Carboy Box Company, Newark, N. J., has perfected a box which is considered an advance in the methods of packing and shipping of chemicals in glass containers. The box is made entirely of wood, built with cushioning interior walls, arranged so that glass containers can be packed without the use of any protective packing material of any kind.

In describing the new box to representatives of the chemical industry, Charles Lefkowitz, president of the company, said: "Hitherto each glass bottle had to be packed in protective layers of hay or mineral wool, etc. This meant a very considerable cost in labor and material items, combined with the dirt of having these materials on the premises. In cold weather, there was always the trouble arising from the moist hay freezing

against the bottle and packing box, making it difficult and often dangerous to remove glass containers.

"Even with these protectve packing materials, under the best conditions, the rough handling and knocking about in transit caused a very considerable breakage and loss, coupled with danger to the employees who handled these shipments both on the railroads and in the factory or warehouse. The Hercules box needs no packing materials of any sort. You just drop the bottle in, and it's packed. That is all there is to it.

"The Interstate Commerce Commission has tested the Hercules box for safety in transportation, and approved it after a severe swing test and a drop test. In the swing test, the Hercules box, containing filled bottle, was swung by approved apparatus against a steel bumper embedded in concrete from a distance of fifty-five inches, and 95 per cent of the boxes passed O. K., without damage to box or contents. In the drop test, the same bottles were dropped from a height of seventeen inches aboveground into the boxes, and this test showed 100 per cent of the bottles slipped into place without damage to box or bottle. The requirements of the commission have been more than met.

"We have eliminated for the manufacturer the cost of packing time and packing materials; have made the handling in transit and at destination safer and speedier by reducing weight and labor needed to handle, and have made the handling safer for employees all along the line."

DETERMINATION OF TIN WEIGHTING IN SILK

The Development of a Practical, Analytical Method for This Determination, Made in the Laboratories of the United States Testing Company, Inc., by A. A. Cook

There are numerous methods found in literature for the determination of weighting, but lack of substantiation, as to the actual value of the methods in the laboratory, has incited the writer to a systematic investigation of this important problem. The ultimate aim was, of course, to develop a practical laboratory method for the accurate determination of tin weighting in silk.

The plan of the work readily divided itself as follows:

1. *Ash Determination.*—To what extent does the percentage ash represent the actual added weighting, and is there a constant factor by which this relation may be expressed?

2. *Specific Gravity.*—Is there a definite relation between the amount of weighting on a sample of silk, and the specific gravity of the sample?

3. *Chemical Stripping of Weighting.*—What factors are important in the successful control of such a method?

As a basis for the work outlined above, small skeins of raw silk were boiled off and weighted in the laboratory under known conditions. In this way, the exact amount of weighting added to each skein was known.

The results of the ash determination method on a number of these skeins showed a large variation in error ranging from 10 per cent up to over 35 per cent, while the corresponding factors, representing the mathematical relation of the "weighting actual" to the "weighting found" were anywhere from 1.12 up to 1.56. It is evident that the ash method can be only a crude approximation of the amount of weighting, and has little, if any, analytical value.

Since the specific gravities of raw and boiled-off silk are practically the same, as demonstrated in this laboratory by a large number of determinations, it would be reasonable to presume that tin weighting would increase the specific gravity in proportion to the amount present. Is was found that although a general proportional relation existed, this relationship was not sufficiently accurate for analytical purposes. The specific gravity method, however, should be extremely useful as a short, simple, sorting test to differentiate heavily weighted, lightly weighted and unweighted samples.

The purpose of any chemical stripping method is the removal of all the added weighting material, without affecting the silk itself. The development of a method of this kind consisted therefore of determining the best conditions for this differentiation. Three factors were studied: (1) Temperature of the stripping media; (2) time of contact between silk and stripping media, and (3) composition and concentration of stripping media.

A procedure was drawn up and adopted as a result of this work, and is given in brief as follows:

1. Removal of finishing materials by boiling in distilled water.

2. Treatment with hydrofluoric acid solution (approximately 2 per centt) at 60 to 70 deg. Cent., for twenty minutes.

3. Treatment with sodium carbonate solution (2 per cent) at 60 to 65 deg. Cent. for twenty minutes.

(Note.—The loss by treatments Nos. 2 and 3 represents tin weighting.)

4. Ashing of the treated sample, as a check on the completeness of the stripping procedure.

(Note.—All weighings in the above procedure are made under bone-dry conditions.)

Following this procedure a number of skeins with known weightings were stripped and the weighting determined. In all cases, the "weighting found" was lower than the "weighting actual" from less than 1 per cent up to 3 per cent. The average error by dif-

ference was 2 per cent. The residual ash may be used as a correction factor, since there seems to be a small amount of the weighting which seems to be permanently fixed on the silk, and cannot be removed by chemicals. With such a correction, the value "found" comes in every case within a few tenths of 1 per cent of the true value.

There seems little question but that the chemical stripping method, as developed in this laboratory, gives consistent results of a very fair degree of accuracy.—Silk.

McKERROW BECOMES SALES MANAGER FOR ALTHOUSE

H. Gardner McKerrow, for some time in charge of the publicity department of the National Aniline & Chemical Company and more recently associated with the Hazard Advertising Corporation, has been appointed sales manager for the Althouse Chemical Company, Reading, Pa., assuming his duties in connection therewith on July 1.

The Althouse Chemical Company is one of the few concerns which entered the dyestuff industry in order to supply their own needs for colors during the war period and has since continued to manufacture for general consumption. Their products include a special line of light fast dyes for cotton, wool and silk, practically all of which are entirely new colors, not found in the Schultz classification, and are of special value in producing a wide range of mode shades in conjunction with other well-known dyes, in addition to possessing a field of usefulness as self-colors.

It is the intention of the Althouse Company to extend materially the range of original colors which they are manufacturing. The development of such a line, together with the production of certain special intermediates, is the direction in which they believe the American dyestuff industry should proceed—in other words, to create rather than to imitate.

PEUGNET RETURNS TO SILK ASSOCIATION

ACCORDING to official announcement from the Silk Association of America, Ramsay Peugnet, former secretary and treasurer of the association, is to hold the office again after an absence of a year and a half. He will take the place of Frank G. Barry, who has been secretary since October, 1921, and who will leave in August to become sales manager of the Holeproof Hosiery Company, of Milwaukee, Wis.

Mr. Peugnet is at present assistant to the president of the interests comprising the General Silk Importing Company, the Klots Throwing Company, and the National Spun Silk Company. For the twelve years preceding his resignation in 1921, he served as secretary of the Silk Association, and has become one of the leading figures in the trade. His thorough familiarity with all phases of the industry and the work of its association, especially fits him for the office he will resume.

During Mr. Peugnet's previous term as secretary the Silk Association much more than doubled its membership, and widened the scope of all its activities. Direct contact was strengthened with the centers of raw silk production, and standards were established which have resulted in benefit to the entire industry. The reports of the Raw Silk Classification Committee of the association were the result of work undertaken and accomplished during his regime, and have already become a classic in their field. He was active in initiating the extension of scientific sericulture in China and the contribution of substantial funds to the American colleges at Canton and Nanking. He accompanied the first American silk mission to the Orient in 1920; the first International Silk Exposition and the first National Silk Week of 1921 were organized and carried out under his supervision. During the war he was secretary of the Silk Section of the Textile Division of the War Industries Board.

The Textile Color Card Association was organized in 1915 through the initiation of the Silk Association, and was for four years directly connected with the association. For six years Mr. Peugnet served as its secretary. Before his first connection with the Silk Association in 1919, he was for eight years a member of the former New York Silk Conditioning Works, later absorbed by the United States Testing Company, Inc., the official testing house of the Silk Association. He still holds the office of secretary and treasurer of the company. Mr. Peugnet was active in the organization of the Trade Association Executives in New York City. He was a member of the executive committee of its preliminary organization, and in 1920 was elected its first president.

Mr. Peugnet will assume his duties at the headquarters of the Silk Association early in July.

CHEMICAL EXPOSITION PLANS BUYING FAIR

AT a meeting of the advisory committee of the Ninth National Exposition of Chemical Industries, held June 6 at the Chemists' Club, New York, the plan to make the exposition which will be held this year at the Grand Central Palace, New York, during the week of September 17 to 22, a huge chemical "buying fair" was placed before the committee. The plan as outlined suggested that each exhibitor make every effort to display his goods in a novel method and in a manner which to some degree, at least, will demonstrate their particular characteristics, special uses, and selling points. It was also suggested that all exhibitors arrange to have their full sales forces, or as many as it might be feasible, at the exposition so that they might not only attend company

sales conferences in conjunction with the exposition, but also attend joint sales conferences composed of the sales staffs of all the exhibitors. With the large number of chemical and chemical equipment consumers who attend the exposition each year, this sales contact on a large scale, away from the offices of the buyers, was pointed out as very desirable.

A tentative report from Major H. S. Kimberly, of Washington, who has been selected by the committee to arrange the educational exhibits at this year's exposition, was heard. The chief object of the exhibits will be to demonstrate to the business man just what chemicals can do and are doing, and the place of chemistry in business. The Chemical Warfare Service and the Bureau of Chemistry of the Department of Agriculture will have two large displays among the educational exhibits. Chemicals of the kitchen and the chemistry of food are also included. The results of research on a scientifically correct anti-knock and carbon compound for internal combustion engines will be demonstrated.

Dr. W. T. Read, professor of chemistry at Yale University, was elected a member of the advisory committee of the exposition at the meeting and will take charge of the program for practical courses in chemistry and chemical engineering to be given in conjunction with the 1923 exposition for college students. Dr. Read is a professor of industrial chemistry and will plan the student courses which will last throughout the week of the exposition, to meet the actual operating problems of the industry. Leading authorities in their respective fields will give the lectures.

DYE PROFITS 300 PER CENT

The Badische Anilin und Soda Fabrik has declared a dividend of 300 per cent for 1922, as against 30 per cent in 1921, according to its report given out on June 1. The net profits last year were 3,906,440,000 marks, as compared with 168,750,000 marks in the previous year.

The report states that the depreciation of the mark made it so expensive and difficult to obtain fire insurance from independent firms for the company's buildings and supplies that it, together with other German companies, engaged in the same kind of manufactures, founded their own insurance company.

The dyestuffs business was satisfactory last years, adds the report, although foreign competition continued to make itself "perceptible."

The Dyeing of Textile Fibers for the Hosiery Trade*

By F. ASQUITH

IN choosing the title for my paper I was prompted by the fact that the dyer in the Leicester trade is faced with the problem of dyeing almost all known classes of material.

By the term "dyeing" is meant the coloring of the various textile fibers and other materials in such a manner that the color is not readily removed by exposure to light and washing, and in the case of material dyed in the loose state, the color must stand the various operations of manufacture into cloth or fabric.

The art of dyeing dates from the earliest times, and was practised centuries before the Christian era. Pliny gives a short account of the method employed in the first century. It is highly probable that Indigo was the first dyestuff known to man, and its use is said to have originated in India in the dim past when crude fermentation vats were, and still are, used. From this crude beginning, which has since spread to all parts of the world, the use of coloring matter was founded. Egypt ranks high in the historical use of dyes. This is proved by the analysis of mummy cloths, which shows the Egyyptians were at that time familiar with the use of alum mordant in the production of the brighter shades.

Natural Dyestuffs

Previous to the middle of last century all the coloring materials used as coloring agents were of natural origin, being chiefly obtained from various portions of trees or plants. Logwood has kept its place for dyeing cheap blacks, the shades of which the coal-tar colors have not been able to surpass. The coal-tar blacks, by which I mean the chrome blacks, produce better fastness to light and acids. Fustic still holds a place, and is largely used. Madder was used on alum mordant for the famous Turkey red on cotton, and on chrome mordanted wool for madder reds. Cochineal on tin mordant gave the bright scarlets which were used for hunting coats, and, until recent years, for military uniforms. Camwood and barwood were also used for reds.

The dyer, at the time we are referring to, used as assistants the various salts of chromium, iron, aluminum, tin, antimony, lead and copper, and by practised usage was able to produce a most varied range of shades. Cutch was used for fast browns on cotton.

*A paper read to the Leicester Branch of the Foreman Dyers' Guild. Copyright of the Guild.

Weld, flavin, fustic and Persian berries were used as yellows, while tannin, galls and myrabolams, in conjunction with iron, tin and antimony salts, were employed, and are to-day used as mordants on cotton for the various woods, now usually employed in the form of extracts.

The shades obtained from mineral colors, such as Prussian blue, iron buff, chrome yellow and orange, must be added to the colors produced from vegetable products. The discovery of mauve by Perkin in 1856 and the advancement of coal-tar colors revolutionized the art of dyeing.

In comparison with the ancient dyer the dyer of to-day has more dyestuffs at his disposal, but at the same time the brightness and fastness properties required, coupled with the two great factors of our time —output and cost—makes one imagine that the problems of our ancestors were considerably less than those of the dyer of the present time. I have, however, heard an old dyer say that his mother said there were troubles in the dyehouse fifty years ago, and so, I presume, we shall continue. If there were no problems there would be no dyers required.

Coming to the dyeing of the present day, I have made the remark that there are more colors at the dyer's disposal, but at the same time fashions change much more quickly than formerly, and the foreman dyer has to be prepared each morning to obtain shades on various fibers which were not thought of by our forefathers.

Dyeing Animal Fibers

Taking the dyeing of animal fibers, wool is by far the most important, although for certain classes of work camel hair, goat hair, cow and horse hair have to be dyed, and also the fur from hares and rabbits, which is used largely in the manufacture of hats. Although the chemical character of the various kinds of animal fibers is very much alike, there are differences in the behavior in dyeing, so that the affinity of the various fibers for the dyestuffs varies more or less.

As a general rule, the finer the fiber of wool or hair, the more dyestuff it will absorb in producing a given shade, since, under equal conditions, the finer fiber presenting a larger surface in proportion to the bulk, takes up more color than the coarser fiber. Hence it follows that much depends upon the blending of the wool in order to present an evenly dyed material.

Loose wool, as it comes from the sheep, contains from 25 to 70 per cent of pure wool, according to the class of sheep, and also their mode of living, a larger or smaller amount of impurities (sand and other earthy substances, remains of excrement, and many kinds of vegetable matter) and, finally, a considerable amount of wool grease. A short survey respecting the scouring of wool will be interesting at this point. The above impurities must be removed; hence the object of scouring, which is to extract the grease and remove the dirt adhering to the wool. By this process the wool becomes more open, and is thus more suitable for spinning on the one hand, and for the capacity for absorbing dyestuffs on the other. In cases where one is treating a wool containing much vegetable matter, or burrs, it is extracted, and the first trace of impurity removed in the willowing and spinning operations.

Scouring

Scouring is the most important treatment preparatory to dyeing, and is the fundamental condition if good results are to be obtained. Some wools are washed, or partly cleansed, on the living sheep, with the object of removing part of the wool grease. Foreign wools are frequently treated in the same manner after shearing in order to save freight charges. In large establishments the raw, greasy wool is often subjected to preparatory treatment by steeping and washing with water. The soluble portions dissolved by water consist mainly of potassium salts, the liquid is evaporated and after further treatment yields the by-product, potash.

Nowadays, preparatory scouring is only rarely resorted to, because experience has shown that the previous extraction of the soluble and alkali salts is not always an advantage for the cleaning of the wool. Since they are, in regard to the chemical composition, soaps, their intimate mixture with the grease assists the saponification of the latter when brought into reaction with the alkalies; hence the preparatory scouring is at present dispensed with, and the greasy wools are treated direct in diluted alkaline solutions for the purpose of grease extraction, i. e., both the soluble and insoluble elements of the wool grease are removed in a single operation. Most frequently soda ash is employed as alkali, also potash, ammonia, and soap lyes are used. An addition of oleine to the scouring lye is also frequently made for the purpose of forming, by its reaction upon the alkali, an emulsion with the wool grease, and thereby accelerating the solution.

According to the degree of purity of the wool the scouring bath is made up more or less concentrated. In most cases soda lyes of 1½ to 3 deg. Tw. are used. The temperature should generally not exceed 122 deg. Fahr., as a higher temperature, especially when soda lye is used, turns the wool yellow and brittle. Very greasy wools can be scoured at 120 to 130 deg. Fahr., whereas half-scoured wools must not be treated higher than 104 to 112 deg. Fahr. This scouring and subsequent washing off is carried out in specially constructed machines, such as the McNaught, which is composed of three to four cisterns or bowls behind each other. The first bath contains the soda lye, the second four to five pounds of soap, the third bowl one to two quarts of ammonia at 100 deg. Fahr., and lastly, clean cold water.

It is customary in the dyeing of loose wool that the fastest colors are used, as, after spinning, the yarn is woven into the heavier cloths for overcoatings and gentlemen's wear, which in the process of manufacture have to withstand heavy milling and potting in order to obtain the required finish on the piece.

Chrome Colors

I am still of opinion that the chrome colors which are used for this class of work, owing to their superior fastness to milling and washing, could be used on hose and fabric by one of the following methods of application:

1. On a chrome mordant.
2. Afterchrome method.
3. Metachrome or Eriochromal method, which combines the dyeing and the mordanting at the some time with bichrome or neutral chromate in the bath.

Taking the above methods in the order given, I will deal with the application on chrome mordant:

(a) Sweet chrome, in which case the wool or hose is first boiled for one hour with 3 per cent bichromate of potash.

(b) Reduced chrome mordant is produced by boiling for one hour with 3 per cent bichromate and 2 per cent tartar. Formic acid, oxalic, or lactic acid is sometimes used in place of tartar. The bichrome tartar mordant is largely used in the dyeing of piece goods and is accompanied by good results, also the handle of the material is not impaired.

(c) The oxidized chrome mordant is obtained by boiling one hour with 3 per cent bichrome and 1 per cent sulphuric acid, producing the green chromium oxide on the fiber.

This question of mordants is a very open one, as I have met dyers who adopt one or other of the above methods and who individually testify to the good results they obtain.

The application of the chrome colors on loose material is generally by the afterchrome method, the shading off being done by the addition of colors which are not affected by the presence of chrome in the dye bath.

In the case of fabric and hose, except in the cases of blacks and standard shades of nigger brown and navy blue, I recommend the use of the metachrome process, as thereby the shade is developed at once on the fiber and the matching off can be more easily carried out.

Reverting to the Eriochromal method, the following is a list of colors which are suitable for dyeing by this process:

Yellows.—Eriochrome Yellow 2G1 and S. Eriochrome Flavine A.

Violet.—Eriochrome Violet 3B.

Blues.—Eriochrome Azurole B.

Blacks.—Eriochrome Blk. E. Conc.

Oranges.—Eriochrome Orange R and Phosphine RR.

Reds.—Eriochrome Red G. Diph. Fast Red B.

Greens.—Eriochrome Verdone S.

Browns.—Eriochrome Brown G, Paste and Powder.

The above colors have excellent fastness to light and milling and possess good level dyeing properties.

The dyeing of worsted and woolen yarn is also one of the most important branches of the Leicester trade. Mainly the level dyeing acid colors are adopted for yarn dyeing, as the greatest difficulty in this branch of work is to obtain level results. A vast amount of trouble is caused by not thoroughly scouring the yarn preparatory to dyeing, also by not removing all the soap in the washing off.

All Cotton Fabrics

I now come to the dyein gof all cotton fabrics. Hose, and also yarn, will be of interest to you, but, as I am not aware that any cotton piece dyed on the pad, jigger or beam is carried out in this district, these can be left to the Lancashire and Yorkshire districts.

The cotton, before dyeing, must be well boiled and bleached if intended for light shades. The yarn or fabric is generally boiled in a low-pressure keir. This is packed into the kier and boiled with the addition of 5 per cent soda ash overnight. If a keir is not available, the material should be sewn up in canvas bags and boiled in a cistern for at least eight hours. When dyeing in barks, it is preferable that the liquor should be heated by a coil to prevent dilution of liquor by condensation of steam. As heating a bark by steam coils takes rather a long time, a direct steam pipe should also be fitted to the bark, so that the bath may be brought to the required temperature by means of direct steam, and the heat maintained by means of the coil.

In the dyeing of different cotton colors, the yarns are usually entered at 140 deg. Fahr., given a couple of turns, the bath then being brought up to 195 to 200 deg. Fahr., and the dyeing continued for half to three-quarters of an hour.

When dyeing heavy shades, enter the yarn at 195 deg. Fahr., and after working for three-quarters of an hour shut off steam and allow the yarn to feed in the cooling bath. If difficulty arises in getting light shades level, commence dyeing with 1 per cent soda ash only, and add the Glauber salt when the cotton material has been dyeing a quarter of an hour.

The dyeing of direct colors on cotton is a fairly straightforward process, but in actual practice, while

it is a short process, there are several factors which have to be taken into consideration and which demand the experience and judgment of the foreman dyer. Some of these are as follows:

The temperature at which direct cotton colors dye varies considerably with the various dyestuffs, e. g., Diphenyl Chrysoine 3G will dye cotton almost as full a shade at 100 deg. Fahr. as it does at the boil; on the other hand, Diphenyl Fast Scarlet 4BS does not appreciably go on the cotton below 140 deg. Fahr. It follows from this that different colors dye at different rates. This may be the cause of considerable trouble in the dyeing of compound shades, because the use of color dyeing at different rates has a tendency to give uneven results.

For the dyeing of compound shades the most soluble dyes should be chosen, and those which do not rush on too quickly; particularly must such colors be chosen for shading purposes. Diphenyl Blue Black MBH, Diphenyl Brown MG, Diphenyl Chlorine Yellow FF and Diphenyl Catechine G Extra are the most useful colors for dyeing compound shades.

In dyeing heavy shades which are in constant demand, such as blacks and navies, it is necessary to keep up the dye bath, in which case it is advisable to use three-quarters the original amount of color to replenish the dye bath, and one-quarter the original amount of assistants. Care should be taken not to add too much common salt in the dye bath, as this gives uneven results and tends to precipitate the dyestuff. The cold dye liquor should not stand at more than 6 to 8 deg. Tw. when dyeing dark shades.

Owing to the fact that many of the direct cotton colors are improved in fastness to light and washing by aftertreatment with formaldehyde and metallic salts, and that this process is simple in its application, their use is warranted where extra fastness is essential.

The use of formaldehyde for increasing the fastness to washing was first introduced by Messrs. Geigy. Copper sulphate and bichromate of potash in the presence of acetic acid are also used and considerably improve the fastness to light, as well as washing.

Developed Colors

The first direct cotton dyestuff which could be diazotized and developed, Primuline, was discovered by Green in 1887. The color itself had no special interest as a direct dyestuff owing to its fugitiveness to light. It was, however, discovered that owing to the presence of a free amido group it could be diazotized and developed by combining it with various amines and phenols, and a range of yellow, orange, red and maroon shades, of good fastness to milling, washing, and boiling acids could be obtained.

This operation can be carried out by first dyeing the cotton with a diazotizable color, then diazotizing and developing on the fiber. The good properties of the resulting colors, because of the methods employed in application, had to gain the confidence of the dyer by proving themselves, and the uses to which the different classes of goods were subjected eventually led to the adoption of this process and Primuline Red (Primuline and beta-naphthol) became a standard shade. Owing to the lack of a sulphur red, developed reds have still held their own where reds fast to boiling acids, milling and crabbing are required. Many other colors of the diazo class can be used by the above methods, the most important being Diphenyl Blue, Black BH, Diazo Black N and V, Diazo Blue RL and BBL, which are most used owing to their fastness to washing.

Diazotize with 3 per cent sodium nitrate, 10 per cent hydrochloric acid, or 3.5 per cent sulphuric acid.

The following developers are most commonly used according to the shade required: Beta-naphthol, meta-phenylene-diamine, meta-toluylene-diamine and resorcine.

Sulphur Dyes

The first known dyestuff of this class was Cachou de Laval, which was discovered in 1873. After that came the French chemist, Vidal, with his Vidal Black in 1893. This dyestuff was at once novel in its application and outstanding in its properties of fastness to light, milling, washing, and boiling acids, far surpassing any cotton black known to the cotton dyers, with the exception of aniline black produced on the fiber by the oxidation of aniline oil or salts. Vidal's discovery aroused great interest both in color making and dyeing circles with the result that the fusion of organic bases with caustic soda and sulphur was so intensively and successfully worked that the consumption of sulphur dyestuffs is now extremely large. The range of this class of dyestuffs includes blacks, blues, greens, browns, oranges and yellows. There are, however, some notable gaps in the series, and Eclipse Fast Bordeaux is the nearest approach to a red obtainable.

These colors are applied by dissolving the sulphur dyestuff along with sodium sulphide and soda ash, first stirring into a paste, and then boiling up for five to ten minutes. The color is then added to the dye bath along with the necessary amount of Glauber salt, or common salt, and the dyeing continued at a temperature of 195 deg. Fahr. for one hour.

For standing baths it is necessary to add three-quarters the amount of color and the same proportion of sodium sulphide. It is a good practice to give the dye bath a slight excess of sulphide in the first bath so as to ensure the color being in perfect solution.

Indigo and Other Vat Dyestuffs

The vat dyestuffs from the point of view of the chemist are classified into three groups, i. e.:

Chloranthrene Blues.
Indigo and Thio-Indigo.
Hydron Blue.

This class of dyestuffs is readily gaining favor among cotton dyers owing to the fastness to light and washing of the majority of the colors included. The one drawback, however, is the difficulty of shading, but I know of one firm of dyers who have sent out a pattern card showing seventy different shades; these are mostly used for casement cloth, and I have yet to learn that many are being used in the Leicester district.

The principle of dyeing vat colors is exactly the same as in the case of Indigo. The colors are insoluble in water, but are reduced to leuco compounds by taking hydrogen, and these compounds are freely soluble in alkali. The only vat used is the hydrosulphite-caustic soda vat.

The anthracene series require much more alkali than the indigoid or hydron class, as will be seen from the following recipes which give approximately the same depth of shade using twenty time liquor on the weight of yarn:

Anthracene Series:

10 % Chloranthrene Blue BD 10% paste.
30 % Caustic Soda 76 deg. Tw.
2¼% Hydrosulphite powder conc.

Indigoid Series:

2% Ciba Blue 2R powder.
1% Caustic Soda 76 deg. Tw.
1% Hydrosulphite powder conc.

Sulphide Bath Series:

6 % Hydron Blue G paste.
6 % Sodium Sulphide crystals.
6.6% Caustic Soda 76 deg. Tw.
6 % Hydrosulphite powder conc.

From the above it will be seen that the anthracene series requires four times as much alkali as the other two, and much less hydrosulphite.

A curious fact is that a light shade requires just as much caustic as a heavy one, for which an adequate explanation is not given, though as a practical fact it is indisputable. The caustic soda plays a most important part and requires to be calculated on the volume of liquor employed and not on the amount of dyestuffs. Without a sufficiency of caustic soda good results cannot be obtained.

Anthracene Class

The method of dyeing piece goods in the jigger is to add the color to the dye bath in two portions, stirring the color into a paste with two-thirds of the caustic soda and half the hydrosulphite, and water at 150 deg. Fahr. In the jig put the remaining third of the caustic soda and half the balance of the rest of the hydrosulphite; add half the color in the tub, give the piece one end, add the balance of the hydrosulphite and the remaining half of the color, then another end; the dyeing is completed in five ends, the temperature of the bath being maintained at 140 deg. Fahr. Give three ends in a chrome bath containing 2½ per cent bichrome added at twice; follow by three ends in running water; sour with hydrochloric or sulphuric acid for three ends, wash off, and give four ends in a boiling soap bath charged with soap and soda ash; finally three ends in running water.

The above illustrates one method of dyeing vat dyestuffs. The personality of the dyer, however, plays a great part in the methods employed and many variations are to be found.

Indigoid Class

Stir the color into a smooth paste with the caustic soda and a little cold water; hot water is then added, finally the hydrosulphite. It will usually be found necessary to boil in order to obtain perfect solution. The leuco compounds are bright golden yellow in color, which enables the condition of the bath to be easily gauged. Greenish looking baths are not in perfect condition. The cotton is dyed at 140 deg. Fahr. and the color is oxidized back slowly in the air, which makes the manipulation comparatively easy.

Sulphide Vats

Add to the bath at 160 deg. Fahr. the dyestuff (Hydron Blue), sodium sulphide, caustic soda, and finally the hydrosulphite. The vat when in proper condition is yellow. The use of sodium sulphide in conjunction with hydrosulphite has been found advantageous in that better penetration is obtained. This class of vat dyestuffs may be dyed with sodium sulphide alone, but the results are not as good as those obtained by the above method.

Whichever class of vat dyestuff is being dyed they are always soured after dyeing to neutralize the strong alkalinity of the dye liquor, then strongly soaped, again washed and dried. The soaping is a most important operation because it has a marked effect on the color in that it both develops and brightens the shade. This further adds to the troubles of the dyer because it makes matching off all the more difficult.

Basic Colors

The basic colors may be applied to cotton by any of the three following methods, i. e.:

(a) On Turkey red oil mordant (10 per cent solution).

(b) With alum and soda ash in a single bath.
(c) On a tannin mordant.

The first two methods are not much used, so I will proceed to the tannin mordant.

The amount of tannin required for mordanting depends upon the depth of shade to be dyed. For a full shade 5 per cent tannic acid is necessary, and for fixation 2½ per cent tartar emetic. The method of procedure is as follows: Material is entered into boiling bath charged with the requisite amount of tannin and worked for fifteen minutes to insure the material being thoroughly penetrated. It is then immersed under the liquor and allowed to steep overnight. The following morning the material is wrung out evenly and fixed without washing in the bath prepared with the necessary amount of tartar emetic, and worked cold for half an hour and then rinsed.

To obtain good results in dyeing it is absolutely essential that the tannin should be fixed evenly on the material or otherwise uneven results will result. The goods are entered into the dyebath, the color being previously dissolved by mixing into a paste with cold water and the addition of a little acetic acid, then pour boiling water over the color paste while stirring until the color is dissolved, then pass the dissolved color through a fine mesh sieve into the dye bath. Enter cold with the addition of 3 per cent to 5 per cent acetic acid. Work cool five to ten minutes and gradually raise to 140 deg. Fahr., when the dye bath should be exhausted.

Artificial Silk

There are five different kinds of artificial silk:

1. *Chardonnet.*—Which is produced by treating cotton with a mixture of nitric and sulphuric acid, the sulphuric acid acting as a hygroscopic agent. This nitro cellulose obtained is dissolved in alcoholic ether and the solution pressed through fine holes in water when the nitro cellulose coagulates and forms a fine fiber. On treatment with ammonia and sulphide the danger of explosion is eliminated.

2. *Cellulose Silk.*—Cotton or paper pulp is dissolved in ammonium cuprous oxide and then pressed through fine holes in water containing acid, the artificial silk coagulating and forming a fiber.

3. *Viscose Silk.*—This is obtained by dissolving cotton or paper pulp in alkali and carbon di-sulphide, the solution on pressing through fine capillaries is coagulated in acidified water.

4. *Gelatine or Vandura Silk.*—This is not very important.

5. *Acetate Silk.*—Or Celenese, as it is now called.

Chardonnet silk can be dyed with basic colors direct.

Viscose, which in my opinion is the most important of the artificial silks, and is most largely used, can be dyed like cotton, excepting that the resulting shades are much heavier than on cotton, as the affinity of dyestuffs for this material is much greater than in the case of cotton.

In dyeing the basic colors it is necessary to mordant with tannin and tartar emetic, except in the case of Chardonnet silk, which can be dyed with basic dyestuffs direct.

Union Dyeing

A great portion of the hose consists of artificial silk and wool, and the operation of dyeing is similar to that which obtains in the dyeing of cotton and wool, excepting that when dyeing this mixture with Union colors the artificial silk takes up a greater proportion of the color, and therefore it is a matter for the dyer to select his own neutral dyeing wool colors and direct cotton colors in order that he may use them in the proportions required to obtain a solid shade on both fibers.

The two-bath process is used largely in piece dyeing; that is, the dyeing of the wool first with acid dyestuffs, and then filling up the cotton cold in jigger or padding machine with direct cotton colors and with the addition of a little alkali to prevent the wool being dyed. In hosiery dyeing it is my opinion that the one-bath process is most serviceable owing to the fact that the material to be dyed will not stand the working and knocking about which a piece has to go through by the two-bath method.

BLEACHING WOOL AND HALF-SILK GOODS

By J. C. C., Jr.

(*Concluded from page 470, June 18 issue.*)

Half-silk goods are for the most part bleached with either sodium peroxide or hydrogen peroxide. With sodium peroxide the bleaching must be done in a vessel made of wood or stone, and no metal except lead must come in contact with the bleaching liquor. For heating, an India-rubber tube affixed to an ordinary iron steam pipe answers very well. A lead steam pipe may be uesd, but the stout rubber hose is preferable. The bleaching is commenced with the bath at a temperature of about 120 deg. Fahr., the temperature being raised slowly to 180 deg. Fahr. The process may occupy from two to four hours. For a bath of 100 gallons take 8 pounds of sulphuric acid, 1.84 sp. gr. The acid must be free from iron. After allowing this to cool, add 2 pounds of phosphate of ammonia or ½ pound phosphate of soda and 7 pounds sodium peroxide in small quantities, stirring the powder quickly under the surface with a wooden paddle. The peroxide must be added slowly, so that the bath remains fairly cool. After all is dissolved, skim off any scum that rises to the surface; this varies according to the purity of the water available. For fine work it is preferable to filter the solution through felt or flannel.

The degree of alkalinity of the bleach bath is an important factor in the success of the process, and, owing

to different qualities of water used, in some cases adjustment is required. The bath on being prepared as above should show a slight alkaline reaction. If the alkalinity is too pronounced, a little sulphuric acid should be used to make it more nearly neutral. If the bath is too acid add a little ammonia for the same purpose, or until litmus paper just turns blue.

The bath will suffice for 200 pounds of goods and can be strengthened for a second lot by adding 2½ pounds sulphuric acid and 1 pound 14 ounces of sodium peroxide, and water to make up to the original 100 gallons. Provided the bath is not discolored after this second operation, it can be again strengthened in the same way for a third and possibly a fourth batch of material. When hydrogen peroxide is used, the bleaching takes place in a wooden vessel provided with a reel. The bath is made up with the commercial quality of peroxide to the strength of about 2 volume, ammonia being added until the bath is slightly alkaline. The temperature of the bath is raised to 200 deg. Fahr. and the pieces allowed to lie in the bath for a couple of hours, care being taken to keep the goods below the surface of the liquor all the time; they may then be run for half an hour around the reel and washed off

The Permanganate Process

Probably the best process for bleaching half silk and cotton—i. e., silk stripes—is the permanganate process.

After being thoroughly prepared by steeping all night in diastafor, souring, washing and soaping in soap and carbonate of soda (as previously described) in a five-box open soaping machine, the goods are run through a permanganate of soda (or potash) liquor cold (or lukewarm) at about 2 deg. Be.; they lie in steep in this for about two to four hours, drained and passed through a bath of hydrogen peroxide (cold) containing 10 per cent of acetic acid, wash, etc.

Sodium peroxide may be used instead of the hydrogen, but in this case the water must be made acid first by sulphuric acid, as is customary when bleaching with sodium peroxide; then add by degree the peroxide, then the acetic acid, then a little ammonium chloride equal in quantity to the peroxide. The addition of ammonium chloride is to accelerate the solution of the manganese peroxide in the acetic acid. The goods should be lightly soured and washed.

Sulphur dioxide (sulphurous acid) or bisulphite of soda may also be used to reduce the brown manganese peroxide and bleach the goods white, but the whites are not so permanent as those bleached with permanganate and the peroxides of hydrogen or sodium.

Necessary Precautions

When bleaching silk or half silk, the bleacher must remember that silk is soluble in caustic alkalies and hot dilute acids, also in strong boiling carbonate of soda, and that these things must be avoided. Soap of any strength or temperature and weak carbonate of soda at not over 200 deg. Fahr. are permissible.

In conclusion, the bleacher cannot be too careful that when mixing a peroxide of sodium bath the water is cold (some add ice) and that each portion of the sodium peroxide is completely dissolved before the next portion is added, and that the finished solution *should be made acid if alkaline*, and then brought to an alkaline condition again with ammonia or silicate of soda. Sodium peroxide, not being very soluble in cold water, falls to the bottom, where it accumulates with every addition so that when the solution is tested it is most of the time acid in reaction and an addition of silicate (or ammonia) is necessary; but after the goods have entered and the temperature is raised, the undissolved particles of sodium peroxide dissolve and instead of a slightly alkaline liquor the latter is rather strongly charged with alkali. Under such conditions the silk is oxidized and turns yellow, which color is fast to both chemicals and light, and cannot be removed.

The addition of ice is a good thing, as the chemical reaction of the acid and the sodium peroxide raises the temperature which involves a loss of the hydrogen peroxide. But the most important point is that of making the solution acid after the last portion of sodium peroxide has been added, and then only add the sodium silicate.

It may seem queer to practical and busy bleachers to use such a roundabout way—to make a solution acid, if it is alkaline, and then again go to work and make it alkaline again. Why not stop there at first? But if we consider that not any kind of an alkaline solution of sodium peroxide can be used with good results, but the slightest excess of alkali only is necessary, it will be obvious that a solution that will turn red litmus blue does not show how much of the alkali is present; that at one time it may be more and at another time less; that such may be the case of mixing weighted quantities of sodium peroxide and sulphuric acid at different times, hence this point of acidifying the solution if alkaline, or even when it is neutral, and then bringing it over to the alkaline side with silicate of sodium is not meant for a mere show off, but it is a really practical necessity if the bleacher wishes to avoid yellowing the silk stripe; also, please remember that neutral baths are almost sure to produce yellow silk.

After mixing carefully *cold*, I would advise to heat up the peroxide bath to 120 deg. Fahr., stir up well, and test. If found alkaline, add small quantities of acid until acid turns to litmus, then add sodium silicate until alkaline to litmus. If, however, the solution be acid after bringing the temperature to 120 deg. Fahr., add sodium silicate or some of the other alkaline salts that are used in such cases until the bath is alkaline.—Textile American.

Calco

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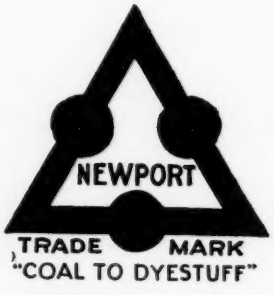

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